

## Cold Weather Operations at Aerowood

*In less than a minute, a single cold start without proper preheating can produce more wear on your piston aircraft engine than 500 hours of normal cruise operation. If it's cold enough, a single cold start can cause the catastrophic destruction of an engine shortly after takeoff. Does that get your attention?*

It's not just a matter of heating the oil, it's the dissimilar metals that cause the problem with cold starts. Read below to how we handle the issue at Aerowood.

### Cold Start

*Words of wisdom from our Chief Pilot, Jim Efird*

Ladies and Gentlemen –

With winter just around the corner, it is time to review winter operations. A cold engine does not want to start, and if you DO get it started using incorrect procedures, you'll hurt it. Cold starts done wrong are really hard on the engine, the starter motor, and the battery (they are usually equally hard on the airman's ego, but that's another issue).

After more than a quarter-century experience starting airplanes in temperatures down where Fahrenheit and Celsius coincide, I think I have some pretty good insights. Let me help you avoid the embarrassment and inconvenience of an unsuccessful cold start, while at the same time saving wear and tear on the engines.

Here's how to do it right.

#### Plan Ahead

When forecast calls for nighttime temps in the mid-30s or lower, it would be great if we could put a heater on the engines overnight. A simple 100-watt droplight is sufficient, even in subzero, to keep the engine warm (although the droplight is not adequate to PRE-heat the morning of the flight). This process, keeping the engine warm rather than getting it warm, is better for the engine overall and reduces the risk of grinding the starter or running the battery down the morning of the flight. BUT, With our new digs here at the FBO, overnight plug-in isn't possible. Which takes us to...

#### Morning of the Flight

*First, think of how cold and heat work*

Hot air rises. Put the heat source as low in the engine compartment as possible, and as near the oil pan as possible. The Arrow has an internal preheater, with the cord affixed to the dipstick: run a drop cord out and plug it in *if near a power source overnight; this is not a preheater; it's a keepheater*. For the rest of the fleet, we'll need to use the preheaters that provide hot air to the engine compartment. As the hot air goes up through the engine compartment it will warm everything. If the heat source must be inserted high in the engine compartment (as with N20052, N2055E, and N5385J), the preheat will be less efficient, will take longer, and the oil will never really get as warm as desired. So give yourself more time if your first flight of the day is in 55E, 85J, or 052.

If you are scheduled for the first flight of the day, give yourself enough time before your flight to preheat. Upon arriving at the airport, set up the preheater before you do anything else. How long should you preheat? Depends: Depends on the type of heater, the overnight temperatures, and the airplane. You will learn from experience.

### **Preheat**

If overnight temperatures have been sub-freezing, the engine is cold-soaked and needs a good long preheat. **Half an hour or more.** You need to heat both the oil and the engine. If the aircraft configuration does not allow inserting the heater hose low in the engine compartment and you have to come in through the nose, **an hour is better.**

We have four electric preheaters at Aerowood, and one propane heater. The electric heaters are safe, effective, simple. The propane heater, however, is a different story. ***Decision has been made not to use the propane heater, though it is very effective if used correctly, because it is also very dangerous if not used correctly.***

We also have numerous blankets and an old sleeping bag. Drape one of these over the cowl while you're heating to minimize heat loss.

### **Exercise the Engine**

After you preheat but before you untie and unchock the airplane, double-check that all switches are off, throttle closed, mixture lean. Then pull the propeller through several times: five or six blades will loosen congealed oil and pull fresh, hopefully warm oil up into the "innards", thus making the start much easier on the engine, the starter motor, the battery, and the pilot.

### **Ready to Go**

Leave the preheater on during your preflight briefing and walkaround.

After the walkaround, disconnect and stow the preheater. Try to plan your tasks so you minimize the time between heater shutdown and engine startup. These engines cool down very quickly.

Once the airplane is preflighted and engine preheated and exercised, take the ropes and chocks off and saddle up. Now, to the cold start:

### **This Procedure will nearly always work for nearly all aircraft engines:**

FLAPS: You probably lowered the flaps for your walkaround. Leave 'em down until after you start the engine. The electric flap motor on Cessnas and Beech take a lot of juice, and you may need all of it to start the engine. Raise flaps after engine start.

PRIME: A cold engine needs lots of fuel. Give it four or five shots of prime. The normal two or three is not adequate. Then pump the throttle two or three times, turn the BATTERY side of the Master on, and hit the starter.

Some have expressed a fear of fire if they overprime the engine. I have never experienced a fire during startup using the procedure just outlined. *Never.* I have, however, frequently observed pilots run the battery down, in the process significantly increasing wear and tear on the starter motor, because they did not prime adequately.

### ***A cold aircraft engine needs lots of fuel or it will not start!***

After the engine starts and stabilizes, adjust power to 1000-1200 rpm, turn on the Alternator side of the Master, and proceed with your piloting chores. Go flying.

### **A Side Note on Warmup Power**

**Note:** I'm leaving the following paragraphs in, though with ~~strikeout~~, to provide a historical point of reference. Recently-discovered procedures from the engine manufacturers have convinced me to back off my procedure of throttling back to under 1000 during the warmup. I still don't like it, but I don't have to like it. Let's try it their way for awhile and see if the new procedure affects maintenance any. However, both Lycoming and Continental continue to admonish pilots to minimize ground operations. These air-cooled engines are made to fly, not to taxi or sit at the chocks for extended periods. While you're sitting there feeding your 430 and studying your checklist, the engine is getting warmer unevenly. That's bad for it.

~~I observe almost daily a pilot sitting at the tiedown studying the checklist, setting radios, briefing passengers, doing all that preliminary stuff we've gotta do before a flight, with the engine at 1200-1500 rpm. If it's really cold you may need this much for a few seconds, but once the engine is stabilized bring it down to under 1000. You're hurting the engine sitting there taking care of your preliminaries with the engine more than 1000 RPM. You're also hurting the brakes, which you're dragging all the way down Taxiway Alpha with that much power.~~

~~If your airplane has a LOW VAC or LOW VOLTAGE light, set the throttle to just over where that light turns off.~~

~~I discussed this with our maintenance staff to see if I'm missing something. They agree: these cold start procedures will save lots of maintenance. The tendency to sit at the tiedown with rpm above 1000 is simply wrong.~~

~~And it hurts the engine. *Don't do it.*~~

## **Winter Flying Review**

Winter just around the corner, and some of you have not yet had the privilege of properly preparing the airplane in the cold. You need to keep in mind that winter flying takes more patience, more time, and more work than warmer days. Give yourself plenty of time to get the airplane ready.

There are weather conditions that affect every nonhangared airplane with ice, snow, and beautiful icicles dangling from wings and control surfaces. ALL that ice and snow MUST be removed COMPLETELY before attempting flight. So how to go about it?

First, **DO NOT scrape it off.** Those deice scrapers they sell at Walmart and NAPA are fine for your Ford windshield, but will badly mar the plexiglass on any GA airplane and will damage the surface on wings, fuselage, empennage. Don't even use your driver's license or credit card. They will scratch the surface.

By far the safest and easiest way to deice the airplane is with sunshine. It is wonderful what a few minutes of sunlight will do for an ice-covered airplane, especially if the airplane is a dark color. Untie it, point the tail at the sunlight, plug in the preheater, and by the time the rest of your preflight is completed the airplane may well be clean.

You can use the brush end of that deicer, or a good broom, to get the loose snow off. Most Alaska pilots carry a janitor's pushbroom in their car for this purpose. Given the large surfaces involved, it makes the job of cleaning a foot of snow off a lot quicker. Brush gently.

One good way to get the frost and ice off is with liquid deicer, a.k.a. alcohol. HEET, that fuel additive you'll find in yellow bottles at the auto supply store, is 99% glycol and works great (applied with a squirt bottle) but it's expensive. We've found an RV deicer that is almost straight alcohol, therefore will not damage the airplane surface or react chemically with the plexiglass. We keep that in a garden sprayer near the preheaters. More recently I found that RainX windshield washer fluid is 14% alcohol. Less alcohol, less effective, but also less expensive.

I've seen guys try to deice with hot water. Frankly, I think that's foolish. It'll get the ice off, but water running down into the control surfaces could freeze, leaving you with no control once you're airborne.

Don't forget the underside. Remember, lift is DOWN on the horizontal tail surfaces. Take off with frost on that nearly-invisible spot and you are a test pilot. There's no telling what the airplane will do, but you are certain not to enjoy the ride.

So, you're deiced and preheated and cranked up. Now what? Well, that's the easy part. ALL your performance parameters improve when it's cold. Shorter takeoff roll, quicker climb, better fuel burn....but you knew that already.

Flying in this kind of stuff is much safer than driving in it. With the airplanes we have a propeller and aerodynamic control, at least to some extent, even on the ground; so it is possible to operate safely with an ice-covered runway. Nevertheless, while taxiing, take it easy; give yourself plenty of time and plenty of room for the slipping and sliding that may well occur on the iced-up taxiways and runways. Be psychologically prepared to shut down, get out, and push yourself out of trouble if necessary.

In all my years flying Alaska and Chicagoland, ice never forced me off the runway, and I only aborted one takeoff (that was in a Lake Buccaneer with frozen brakes).

The tricky part of the flight is landing on an ice-covered runway; even trickier is landing on an ice-patched runway, which can create significantly out-of-balance traction. Either way, use a soft-field technique. Keep it flying as long as you can to maintain aerodynamic control as long as you can, and avoid braking. If the runway is a solid sheet of ice you won't have any braking action anyway; and if it's patchy ice, you may have braking action on one side but not the other. Even gentle braking under those circumstances could jerk you toward the dry side. Best to leave your feet off the brakes. Roll on past that nearby intersection and don't try to turn off until you know you've got traction.

***Happy winter flying!***

## Operating the Preheaters

Many of you have asked about the protocol for preheating. We have four generators - they are just inside the chain link fence beside the gate is behind the fuel trucks. The preheaters and extension cords are in the Aerowood office. Just in case any of you have never operated a generator, the steps for getting it started go as follows:

- 1) Make sure the fuel valve is in the "On" position
- 2) Flip the power switch to "On"
- 3) On the choke, slide the lever to "Start"
- 4) Pull the starter rope to start the engine (this should only take one pull)
- 5) On the choke, slide the lever to "Run"
- 6) Plug the preheater into the generator. You can have **no more than TWO** preheaters running at one time on each generator. The generators must be in SEPARATE duplex outlets (plug them in "side by side", not two in the same duplex outlet)

Since this is a gas powered generator, we have a several red gas jugs for your use. If a jug is getting low on gas, please notify Emily, Marianne, or an instructor. We also have propane heaters, but those are NOT to be used without careful, adequate training, as propane heaters can be very dangerous if you are not careful.

**IMPORTANT:** The generator will run a maximum of two preheaters - whether the forced air "Deuce" model or the plug-in engine heater on the Arrow. Plug one heater into each duplex outlet on the generator, but **do not** plug two heaters into the same duplex outlet.

**Also important:** Please do not unplug or move a preheater to your airplane that is running on another airplane unless you check with the pilot of that other airplane first.

If you have any questions, please give us a call at (980) 263-9025.

Take care, and be safe during the wintry weather!